

# Widescreen Review's Reply Comments To The FCC

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## I. Introduction

*Widescreen Review* respectfully submits these reply comments on the Commission's Fifth Notice of Proposed Rule Making ("NPRM") in its Advanced Television ("ATV") proceeding. We have examined the comment in this rule making and wish to address the issues of audio coding systems alternatives.

*Widescreen Review* is a privately owned bi-monthly consumer magazine with national and international distribution through subscription and newsstand, presently with a distribution of 45,000. The magazine was founded in 1992 and its scope is the home theatre enthusiasts market of the consumer electronics industry. Our readers are lovers of motion pictures and as enthusiasts, seek out the equipment and knowledge to optimize the widescreen digital surround home theatre experience in their homes. Our audience is the "early adopters" of new technologies, who are driven by a sense of "the best that it can be," when embracing new technologies.

Our editorial staff has researched and covered the digital HDTV Grand Alliance system and subsequently the ATSC DTV Standard since Issue 2, January/February 1993, and we have published extensively about this subject in the past 20 issues of *Widescreen Review*.

## II. Audio Coding Systems Alternatives

*Widescreen Review* concurs with the idea submitted by Digital Theater Systems (DTS) to include a provision for bitstreams produced by different audio coding systems within the MPEG-2 transport layer, using descriptors/headers as part of the MPEG-2 systems layer and utilization of the standard's packetized data transport structure, and further supported by a standardized hardware audio decoder. This proposed revision in the standard in no way discards the use of the Digital Audio Compression (Dolby Digital AC-3) system now proposed for required conformance with the ATSC Doc. A/52. Rather the proposed standards revision provides for the advancement of high-end audio through the added provision of a codec technology that is becoming regarded and positioned, in terms of home theatre processor/controller equipment features, as the choice of audiophiles. This is not to say that the Dolby Digital AC-3 coding system is not a first-rate technology. But, advancements in coding technology, such as the DTS coding system, provide for far greater performance in particular bit-rate applications delivering audio transparently, for example at the higher bit rates preferred by many content providers and consumer audiophiles and enthusiasts. Adopting this non-exclusivity revision will further bolster cross-industry interoperability. This is extremely important to the high-end community who wants to see a broad cross-platform implementation of DTS Digital Surround (the consumer trade name for the coding system based on the DTS "Coherent Acoustics" algorithm), as is evidenced by a growing and significant group of high-end equipment manufacturers who are licensing DTS technology.

Dolby states that "there is no fundamental limit to the bit rate at which AC-3 can operate." We have not seen anything in Dolby's own specifications which discusses the operation of AC-3 above 640 kilobits per second (kbps) and therefore believe this statement is irrelevant. What we do know, however, is that for laserdisc and DVD, the mandatory AC-3 specification has been limited for all time to 448 kbps—not even 640 kbps. This step was necessary because commercially available AC-3 DSP implementations cannot reliably decode bitstreams above the 448 kbps threshold, and to allow the AC-3 bit rate to exceed 448 kbps would cause the entire 1st generation AC-3 installed base to become incompatible over night. Given the Dolby documentation which describes AC-3 as a coding system that cannot operate above 640 kbps, if indeed such a system were to operate above 640 kbps then this would invalidate the AC-3 specification, and hence would have to be referred to differently, perhaps "AC-4." Dolby has limited by design its AC-3 coding system in silicon to either 448 or 640 kbps, while DTS, on the other hand, anticipated the need to operate over a wide range of bit rates and has ensured that their current DSP (Motorola 56009) silicon implementations operate up to 1.5 megabits per second while retaining compatibility with bitstreams right up to 4096 kbps. The DTS implementation further delivers 20 to 24-bit sampling precision and the option for lossless variable compression. It is these features of the DTS technology that are particularly appealing to audiophiles and home theatre enthusiasts, features that translate to high-fidelity performance better than CD and comparable to master quality recordings. The DTS system is unique in that it is incredibly flexible and can incorporate rapidly evolving improvements in audio recording techniques including, for example, longer word lengths, higher sampling rates up to 192kHz and more audio channels beyond 5.1 channels. Further, DTS is capable of automatically operating in any mode indicated by the incoming data stream and as well, can operate across all current and future media.

Dolby discredits the *New York Times* writer who compares a DTS audio system operating at a bit rate of 1,411.2 kbps (the data rate for PCM-based Compact Disc) to an AC-3 system operating at a bit rate of 384 kbps. While it is true that this is nearly a 4:1 ratio in bit rate, it is also true that the DTS system sounded dramatically better. Dolby further discredits the writer by claiming a lack of scientific expertise was "obvious when he draws conclusions about the relative quality of the DTS and AC-3 coding systems without having compared them at the same time and under the same listening conditions using identical program material." The fact is that the writer was comparing laserdiscs and music CDs encoded in the DTS system with other laserdiscs encoded in AC-3 to evaluate the differences heard in sound quality character, for example, high-fidelity qualities of timbre, harmonic and spatial integration, soundstage imaging and depth, etc. While differences could be attributed to differences in recording quality, certain sound attributes can be discerned by an experienced listener without commonality of program material. This is a valid assessment. No doubt, a more valid comparison would be to directly compare both systems operating at the same bit rate on the same identical material. Such A-B evaluations have been attempted by the media. But unfortunately, Dolby has refused to participate in such A-B comparisons. The writer in question is highly respected in the audiophile community and is the Senior Editor for the *Stereophile Guide To Home Theatre* as well as the Consumer Electronics Editor for the *New York Times*.

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listening evaluations comparing original master music recordings and motion picture soundtrack recordings to determine the high-fidelity performance and transparency of the DTS "Coherent Acoustic" coding algorithm at various bit rates from 320 kbps to 1,411.2 kbps. The results have been impressive to say the least, even at the low bit rates, which are near transparent. At the high bit rate used for CD, 1,411.2 kbps, the DTS coding system has been proclaimed as transparent to the original master recording, even amongst noted independent and record label audio recording engineers who have extensively tested the DTS coding system before committing to releasing DTS encoded-music CDs on their labels. Yes, there is a new market for DTS encoded-CDs, with sound quality better than CD and comparable to the original master recordings is now in the start-up stages. Several audiophile labels are producing DTS-encoded CDs that have been released or are slated for release in 1996 with more labels expected to embrace the DTS Digital Surround technology in 1997. The first group of labels are DMP, Telarc, Delos and HDS (High Definition Surround).

It should also be pointed out that Dolby has not only shunned the high-end community seeking to comparatively evaluate AC-3 against DTS and against original master recordings, but has consistently denied participation in proposed and actual A-B comparisons with the Society of Motion Picture and Television Engineers (SMPTE), the Audio Engineering Society (AES) and the Academy of Motion Pictures. What Dolby states is true, that "Formal tests have been conducted by the Grand Alliance, MPEG, the Japanese BTA, and ACATS," but these were "required" tests for Dolby to be considered for selection in the digital Grand Alliance system and for the DVD standard. The Grand Alliance tests did not involve DTS, whose consumer technology at the time was not finalized. In the case of DVD, DTS was considered by some in the consortium to be superior to AC-3, but the time frame for incorporation into the standard as the mandatory coding system was pressed and the consortium decided to proceed with AC-3 as the mandatory standard with DTS as an alternate.

Interestingly, Dolby states in its reply comments that, "We are not aware of the DTS system being designed into any new consumer delivery format even though it has been heavily promoted for the last couple of years." Dolby should recollect that it has promoted its AC-3 system for the past four years and yet today (first shown in a prototype consumer product in January 1995), by Dolby's own admission, there are but "(~50,000 as of June '96) products incorporating AC-3 decoders." This can not be a serious claim for AC-3 as an accepted standard in anyone's vocabulary. The other fact that Dolby is aware of is that DTS is imminently to be used on laserdisc releases. Nearly 200 DTS-encoded laserdiscs have been targeted for release using the full CD bit rate of 1,411.2 kbps. Further, DTS has been written into the DVD standards as an alternate coding system for application on a worldwide basis, not just in NTSC countries as is the written mandatory standard application for AC-3.

It is because of the application of DTS on CDs and laserdiscs, and DVDs that it is important for the Commission to fully consider the advantages of DTS inclusion for interoperability. Presently, as of July 1996, there are 26 DTS Digital Surround consumer electronics licensees, with more to be announced in early September at one of the premier home theatre trade shows, CEDIA (Custom Electronic Design & Installation Association), held in Dallas, Texas. The current group of licensees include the most respected, American high-end audio equipment manufacturers in the industry. They are: Acurus, Adcom, Audio Design Associates (ADA), Angstrom, Aragon, California Audio Labs, Carver, CineVision, Citation, Classé, Counterpoint, Elger Systems, Enlightened Audio Designs (EAD), Harman/Kardon, I/O Technologies, Kinergetics Research, Krell, Lexicon, McCormack Audio Components, Meridian, MSB Technology, Perreux, Rane, Rotel, Runco and Theta Digital Corporation. This group is the American consumer electronics dream team. A number of Japanese equipment manufacturers are now considering licensing DTS Digital Surround as well. The same group of American manufacturers have licensed Dolby Digital AC-3, thus providing both coding systems as features on their first and next generation surround processors/controllers and receivers.

Regarding the trend toward general purpose DSP circuits to decode multiple algorithms, this is the future, regardless of Dolby's apparent reluctance to support it. Motorola is not the *only* IC maker to be developing DSP engines for this purpose. Equipment manufacturers are becoming increasingly interested and insistent on single-IC solutions—DSP ICs that are capable of running AC-3, DTS, MPEG, Dolby ProLogic, THX and Circle Surround software. Consumers will demand such features in processors/controllers and digital surround receivers. Those products lacking at least AC-3 and DTS will be overlooked by consumers who will want to decode both movies encoded in AC-3 and DTS, and music CDs encoded in DTS. This is a reality that the Commission should address, and a further reason for non-exclusivity of digital audio coding systems.

Regarding the "DTS claims that the 'Sound Quality Evaluation Disc' which they produced shows that DTS audio coding is more efficient than AC-3," DTS did in fact, use the one- and two-channel version of the commercially-available AC-3 encoder at the time of testing to evaluate sound quality differences between DTS operating in the same one- and two-channel modes at the same bit rates as AC-3. This particular AC-3 encoder was a current production unit (Model DP523, Serial Number 500010, Software Version 1.01/9441) and was used in conjunction with a Dolby decoder (Model DP524, Serial Number 500013). The two units were manufactured well after the time of the initial Grand Alliance codec tests. The units were purchased by DTS in late June of 1995 with the data rate code configuration upgraded from 905 to 901, the latest version at the time of Dolby's algorithm operating at bit rates of 64 kbps mono and 96 kbps per second per channel (192 kbps stereo). While the encoder was not the 5.1-channel AC-3 unit, the encoder software was the latest version of Dolby's AC-3 algorithm. At the time the test evaluations were valid. Dolby refused to cooperate or participate in the industry evaluation, whose results were presented at an invitational event attended by 1,200 representatives of the creative community, consumer electronics manufacturers and press at Universal Studios on September 13, 1995. I am certain that at this moment in time DTS would welcome Dolby to participate in a controlled, unbiased industry A-B evaluation based on the latest versions of their respective coding system software. This is an opportunity for ATSC to conduct new A-B transparency testing.

Dolby states that "DTS claims that 'None of the FCC audio sound quality tests used in-line real-time audio coding-decoding hardware, which is of critical importance for live broadcast applications.'" Dolby is correct in stating that "the ATSC audio coding system was tested as a complete *hardware* system." They are incorrect in their first statement. The complete *hardware* system testing (commenced April 7, 1995) was *after* the Grand Alliance had adopted the AC-3 coding system. Those first tests to determine codec performance that led to the Grand Alliance selection are the tests referred to by DTS. They were conducted, as DTS states, without the use of in-line real-time audio coding-decoding hardware at Lucasfilm Skywalker Ranch, by the Technical Subgroup for Sound of the FCC's Advisory Committee on Advanced Television Service for incorporation in the digital Grand Alliance HDTV sys-

backup to the backup. Jim Gasper, who is the Manager of Technical Coordination at Panasonic Advanced TV-Video Laboratories, Inc. in Burlington, New Jersey was the Chairman of the Subgroup conducting the tests. None of the codecs tested were found to be transparent but Dolby performed better than the others, except that according to Mr. Gasper "it was brought out that it seems that Musicam (MPEG) can do as well as Dolby but probably not better. The *hardware* system tests Dolby is referring to were conducted almost two years later. Further subsequent testing of AC-3 with other coding systems by the Paris, France based International Organization for Standardization found AC-3 not to be transparent. The summary report issued in March 1994 concluded: "The test results for individual codec performance indicate that all of the codecs show significant deviations from transparency...these deviations from transparency are, in several cases, very significant." The tests were conducted at the BBC in London and Telekom in Berlin. The bit rate submitted by Dolby for these tests was 320 kbps, the same used for the theatrical Dolby Digital format, not the 384 kbps Grand Alliance specified bit rate. DTS' "Coherent Acoustics" codec had not yet been finalized at the time of these tests and was not tested.

The comments of DTS request that "unique descriptors and headers be specified within the MPEG-2 transport to facilitate the transmission of alternate audio and video bit-streams." While the MPEG-2 systems layer may allow for the inclusion of additional bit streams of any type and provides a means to uniquely identify them, the FCC needs to specify DTS as an acceptable coding system in addition to AC-3, and revise the standard so that AC-3 is not the exclusive mandatory requirement for broadcast. Instead the Commission should recognize the importance of a market-driven utilization of digital coding systems so that the competition for the advancement of high-end audio can prosper to the benefit of the public to which the standard is supposed to serve.

Finally, DTS' proposal for a Codestream to allow for continuous or periodic updates of improvement in technology in a manner transparent to the consumer is an idea we support. We agree with DTS that the application of a Codestream will assure broadcasters that they will be competitive and compatible with alternative entertainment delivery means as audio technology advances. This solution, coupled with open coding system utilization by content providers and broadcasters, will reduce manufacturers costs by allowing them to use general purpose universal platform ICs produced by many competitive parts makers. Further, as is becoming apparent with new surround sound processor/controller designs, the open platform standard enhances the "feature" capability of manufacturers products which enable manufacturers to automatically take advantage of audio technology advances without having to redesign their decoder products. For consumers it assures that their investment in surround sound processor/controllers and receivers will not need to be replaced to take advantage of new audio technology. Further, the competition provided by the open platform standard will assure consumers the lowest cost possible for equipment.

### III. Conclusion

It is an accepted fact that Dolby Digital AC-3 has already an established base of support. Is it the best performance coding system now available? According to our experience, the test findings and in discussing the quality differences with licensees of both Dolby and DTS coding systems the answer is no. In comparison to the *de facto* surround sound matrix technology standard, Dolby Surround®/Dolby ProLogic®, it is spatially superior because it is a discrete 5.1 channel system. But the issue before the Commission is to "promote competition and reduce regulation in order to secure lower prices and higher quality services for American telecommunications consumers and encourage the rapid deployment of new communications technologies," which the end result is to encourage the best possible performance. Our view is that by mandating the monopoly of a single proprietary audio coding system (Dolby Digital AC-3) the Commission will endorse a standard that departs from this principle. By providing choice of audio coding technologies in the ATSC DTV Standard the door is open for digital licensees to freely choose audio coding and compression systems appropriate for their program material. This will allow broadcasters to take advantage of the flexible nature of the packetized data transport structure of the overall DTV proposal. Within that structure is a straightforward process to include provisions for many different types of audio coding techniques, including the DTS "Coherent Acoustics" audio coding system. Our particular interest in this approach, while the advantages are numerous, is that of enabling higher quality audio coding while increasing product differentiation and encouraging continuing innovation in audio coding techniques towards bettering "the best that it can be" in multichannel high-fidelity performance.

It is not too late to debate this important issue of expandable performance through an open platform audio standard. It has been said that the FCC has a distinct public obligation to ensure that Americans are not casualties in the battle of technical giants for supremacy of a particular proprietary approach. The issue at hand is one of those battles yet to be won by the American people. Americans need to know that they are buying into an on-going system which will not falter because of technical obsolescence. Given that the ATSC DTV Standard is to last for years if not decades to come, it would be a failure of the Commission's due diligence and lack of responsibility to not proceed with this evaluation so that a correction to the standard can be expediently implemented. After all, what is the purpose of these proceedings if not to catch deficiencies and oversights and make the necessary "last minute" new technology fine tuning adjustments, if not fixes, to assure that the ATSC DTV Standard is absolutely "the best that it can be?!"

Thank you for your time and kind consideration of our endorsement of the open platform audio standard concept.

Respectively submitted,



Gary Reber, Editor & Publisher  
Widescreen Review  
26864 Mandelieu Dr.  
Murrieta, CA 92563  
909 677 0335

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